Amendments to the Claims

1. (Currently Amended) An apparatus for dynamically measuring thickness of a test object, comprising:

an eddy current sensor having first and second sensor heads, said sensor heads positioned ~~to have~~ opposite each other and defining a predetermined gap therebetween for passage by at least a portion of the test object through said gap, said first and second sensor heads making measurements at one or more sampling locations on said test object when at said gap;

a mechanism for moving the test object through said gap while said measurements are made;

a position sensing mechanism, said position sensing mechanism being used to determine one or more positions of said one or more sampling locations on said test object; and

an evaluation circuit in communication with the eddy current sensor and with the position sensing mechanism, said evaluation circuit being used to determine the thickness of the test object at said one or more sampling locations.

2. (Original) The apparatus of Claim 1, wherein said mechanism for moving the test object through said gap comprises a robotic end effector.

3. (Original) The apparatus of Claim 1, further comprising a displacement sensor for detecting displacement of the test object in a direction generally extending between the first and second sensor heads.

4. (Original) The apparatus of Claim 3, wherein said displacement sensor is in communication with said evaluation circuit, and wherein said evaluation circuit adjusts said measurements of said sensor heads to compensate for detected displacement of the test object.

5. (Original) The apparatus of Claim 3, wherein said displacement sensor comprises a laser distance sensor.

6. (Original) The apparatus of Claim 1, wherein said evaluation circuit is implemented in a computer controller.

7. (Original) The apparatus of Claim 6, wherein said controller comprises an analog to digital converter, a programmable logic control, and a personal computer.

8. (Original) The apparatus of Claim 1, wherein said position sensing mechanism comprises an array of position sensors that successively detect an edge of the test object as the test object is moved through said gap.

9. (Original) The apparatus of Claim 8, wherein said evaluation circuit determines a velocity of the test object from outputs of said position sensors.

10. (Original) The apparatus of Claim 8, wherein each position sensor comprises an optical sensor.

11. (Currently Amended) A method of measuring thickness of a test object, comprising the steps of:

moving the test object through a gap between two eddy current sensor heads, said two eddy current sensor heads being positioned opposite each other;

making on-the-fly measurements at one or more sampling locations on said test object using the eddy current sensor heads as the test object is moved through said gap;

determining one or more positions of said one or more sampling locations on said test object; and

calculating the thickness of the test object at said one or more sampling locations.

12. (Original) The method of Claim 11, wherein the step of moving said test object is performed using a robotic end effector.

13. (Original) The method of Claim 11, further comprising detecting displacement of the test object in a direction generally extending between the first and second sensor heads.

14. (Original) The method of Claim 13, further comprising adjusting said measurements to compensate for said displacement of the test object.

15. (Previously Presented) The method of Claim 11, further comprising displaying data specifying the thickness of the test object at said sampling locations.

16. (Original) The method of Claim 11, wherein determining the positions of said sampling locations on said test object comprises successively detecting an edge of the test object as the test object is moved past said sensor heads.

17. (Original) The method of Claim 16, further comprising determining the velocity of said test object.

18. (Original) An apparatus for measuring thickness of a conductive layer on a wafer substrate, comprising:

an eddy current sensor having two opposed sensor heads mounted in said apparatus to have a predetermined gap therebetween for passage by at least a portion of the wafer substrate through said gap, said first and second sensor heads making on-the-fly thickness measurements of said conductive layer at given sampling locations on said wafer substrate as said wafer substrate is passed through said gap;

a position sensing mechanism to sense positions of said wafer substrate relative to said sensor heads as said wafer substrate is passed through said gap;

a controller connected to the eddy current sensor and to the position sensing mechanism for calculating the thickness of the conductive layer at said sampling locations.

19. (Original) The apparatus of Claim 18, further comprising a robotic end effector for moving the wafer substrate through said gap.

20. (Original) The apparatus of Claim 18, further comprising a displacement sensor for detecting displacement of the wafer substrate in a direction generally extending between the first and second sensor heads.

21. (Original) The apparatus of Claim 20, wherein said displacement sensor is in communication with said controller, and wherein said controller adjusts said measurements of said sensor heads to compensate for said displacement of the wafer substrate.

22. (Original) The apparatus of Claim 20, wherein said displacement sensor comprises a laser distance sensor.

23. (Original) The apparatus of Claim 18, wherein each sensor head includes a core and at least one coil mounted therein.

24. (Original) The apparatus of Claim 23, wherein said controller comprises an analog to digital converter, a programmable logic control, and a personal computer.

25. (Original) The apparatus of Claim 18, wherein said position sensing mechanism comprises an array of position sensors that successively detect an edge of the wafer substrate as the wafer substrate is moved through said gap.

26. (Original) The apparatus of Claim 25, wherein said controller determines a velocity of the wafer substrate from outputs of said position sensors.

27. (Original) The apparatus of Claim 25, wherein each position sensor comprises an optical sensor.

28. (Original) A method of measuring thickness of a conductive layer on a wafer substrate, comprising the steps of:

making on-the-fly thickness measurements of said conductive layer at multiple sampling locations on said wafer substrate using first and second eddy current sensor heads positioned on opposite sides of said wafer substrate while moving said wafer substrate past said eddy current sensor heads;

determining positions of said sampling locations on said wafer substrate; and

calculating the thickness of the conductive layer at said sampling locations.

29. (Original) The method of Claim 28, further comprising detecting displacement of the wafer substrate in a direction generally extending between the first and second sensor heads.

30. (Original) The method of Claim 29, further comprising adjusting said measurements to compensate for said displacement of the wafer substrate.

31. (Previously Presented) The method of Claim 28, further comprising displaying data specifying the thickness of the wafer substrate at said sampling locations.

32. (Original) The method of Claim 28, wherein determining the positions of said sampling locations on said wafer substrate comprises successively detecting an edge of the wafer substrate as the wafer substrate is moved past said sensor heads.

33. (Original) The method of Claim 32, further comprising determining the velocity of said wafer substrate.

34. (Previously Presented) A method of measuring thickness of a test object, comprising the steps of:

generating magnetic flux on opposite sides of the test object and sensing induced eddy currents on said test object at multiple sampling locations on said test object while the test object is moved relative to a given position;

determining positions of said sampling locations; and

calculating the thickness of the test object at said sampling locations.

35. (Original) The method of Claim 34, wherein said magnetic flux is generated by two opposed eddy current sensor heads, and wherein said given position is a position between said sensor heads.

36. (Original) The method of Claim 34, wherein said magnetic flux is generated by two opposed eddy current sensor heads, and said method further comprises detecting displacement of the test object in a direction generally extending between the first and second sensor heads.

37. (Original) The method of Claim 36, further comprising adjusting thickness calculations to compensate for said displacement of the test object.

38. (Previously Presented) The method of Claim 34, further comprising displaying data specifying the thickness of the test object at said sampling locations.

39. (Original) An apparatus for measuring thickness of a test object, comprising:

means for generating magnetic flux on opposite sides of the test object and for sensing induced eddy currents on said test object at multiple sampling locations on said test object as said test object is moved relative to a given position;

means for determining positions of said sampling locations; and

means for calculating the thickness of the test object at said sampling locations.

40. (Original) The apparatus of Claim 39, wherein said means for generating magnetic flux comprises two opposed eddy current sensor heads, and said apparatus further comprises a robotic end effector for moving said test object relative to said sensor heads.

41. (Original) The apparatus of Claim 39, wherein said means for generating magnetic flux comprises two opposed eddy current sensor heads, and said apparatus further comprises a detector for detecting displacement of the test object in a direction generally extending between the first and second sensor heads.

42. (Original) The apparatus of Claim 41, further comprising means for adjusting thickness calculations to compensate for said displacement of the test object.

43. (Previously Presented) The apparatus of Claim 39, further comprising an output device for displaying data specifying the thickness of the test object at said sampling locations.

44. (Previously Presented) A method of measuring thickness of a test object, comprising the steps of:

moving the test object using a robotic end effector past an eddy current sensor;

making on-the-fly measurements at one or more sampling locations on said test object using the eddy current sensor as the test object is moved past said eddy current sensor;

determining one or more positions of said one or more sampling locations on said test object; and

calculating the thickness of the test object at said one or more sampling locations.

45. (Previously Presented) The method of Claim 44, wherein determining the positions of said sampling locations on said test object comprises successively detecting an edge of the test object as the test object is moved past said eddy current sensor.